Catalog

Chapter 1 Basic information and packaging

GTT-030 network time server is the professional network equipment, providing highly-stable time source. GTT-030 network time server receives GPS satellite signals and extracts the timing information to adjust the server's local time. It distributes standard time via NTP protocol (Network Time Protocol). Upon the PC or server which need time synchronization services, a client program will read the NTP protocol, derive time information, and modify the time of related equipment. The network time server is widely used in telecommunications, finance, taxation, public security and other special network as well as common corporate network to unify the network time.

1.1 Key features

- Receive GPS satellite signals or the dual-satellite signal of GPS and GLONASS (optional)
- Adopt RFC1119/1305 NTP protocol (Network Time Protocol) to delivery time
- Support RFC1769/2030 SNTP protocol (Simple Network Time Protocol)
- Different client programs support Windows 98/2000/NT/XP, Linux, Unix, FreeBSD and other operating systems, to adapt to different applications
- 10/100M BaseT adaptive network interface
- Ways of maintenance: the local maintenance serial port; remote login; remote dial-up.
- 2 lamps display the device working status

1.2 Packaging

Please check the shipping package which should contain the following items:

(1) GTT-030 network time server

(2) Power cable

(3) 1 meter cable

(4) rack set screws

(5) GPS satellite receiving antenna

(6) Antenna cable

(7) Antenna fixed accessories

(8) The user manual

(9) The software CD

(10) The packing List

1.3 Outline

With the rapid development of modern society, higher demand on the time precision and frequency is put on the agenda. Nowadays with the development of modern digital communication networks and the information superhighway construction, the political, cultural, technological and social information coordination is based on a strict system of time synchronization, especially in the communications, electricity, financial securities, computer networks, production line operation, administration and national defense and other fields urgently need the time synchronization equipment.

Global Positioning Satellite (GPS) signals act as the reference source of GTT-030 network time server. The time reference contained in the GPS satellite signals synchronizes with the universal time coordinated (UTC). The long-term frequency stability has achieved the10-13 level of magnitude of cesium atomic clock, which is equivalent to be only 1 second slower during 30 years. To adjust local time with this reference signal can eliminate the accumulation of deviation resulted from the low accuracy of local clock time and also can greatly improve the timing precision of the server. GTT-030 network time server use a professional 12-channel GPS receiver. It can receive and lock the satellite signal fast and reliably.

NTP protocol (Network Time Protocol) is a common international network timing protocol. Its principle is through the client to launch a time polling to the server after an interval of time. According to a certain filtering algorithm it can calculate the time deviation between the server and the client as well as the propagation delay caused by network transmission. Then according to these two parameters to adjust the client's local time and make it consistent with the server. Compared to other time calibration prorocols, NTP protocol can eliminate the impact caused by network transmission delay, so it can provide high-precision timing services. Detailed description can be referred to the latest protocol standards documents RFC1305 and RFC2030. GTT-030 network time server can be compatible with NTP v2 / v3 / v4 in various versions.

1.4 The device description

Figure 1-1 The front panel description

- The front panel is as shown above. The interface functions are as follows:
- monitoring: local monitoring serial port, DB9 public outlet, RS232 electrical level
- Network: 10/100M Base-T adaptive network port, RJ45 connector
- 2 Indicator lights: one indicates the power while the other indicates the status, both of them indicate the device working state

Figure 1-2 The back panel description

The back panel is as shown above. There is a power socket with a fuse on the back panel. After opening the fuse base, there are a primary and a reverse fuse with specification of 0.5A on each side to facilitate users' replacement. In addition, there is also an antenna plug as well as 50 ohm BNC Socket.

Chapter 2 Hardware installation and commissioning

2.1 The device structure

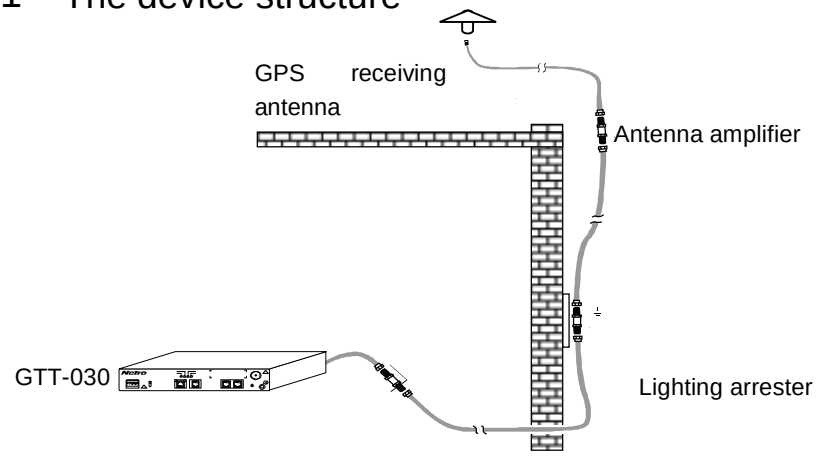


Figure 2-1 Device Structure

GTT-030 network time server consists of the outdoor part and interior part. The outdoor part is composed of the GPS satellite receiving antenna, surge arrester and antenna amplifier (optional). The function is to complete the reception of satellite signals.

The interior part is the master device of GTT-030 network time server to complete the functions of the satellite signal demodulation, the local clock calibration, achieving NTP protocol and so on. It provides NTP timing service to other network equipment by means of 10/100M Base-T adaptive network ports. The following are the detail installation description of the outdoor part and the interior part.

2.2 Outdoor installation

The outdoor part consists of the GPS satellite receiving antenna, surge arresters, transmission cables and antenna amplifier. The installation attentions are as follows:

At first, the antenna installation location needs to be carefully selected, which will signigicantly influence the equipment working. The antenna should be installed in high places and can not be blocked, such as the roof, open top, etc. If you want to achieve better results, you' d better keep the elevation angle of 15 degrees not blocked. It is useless to install the antenna inside the room because GPS satellite signal is very weak and can not be received indoors. It is no matter if there are trees or plastic rain shelter blocked above the antenna, but other block will influence the signal significantly. In fact, only a book above the antenna can completely block out the satellite signal.

Antenna installation should be lower than the lightning rod or other constructions that can attract thunderstroke and the installation location should better be 10-15 meters away from them. GPS antenna itself is rarely struck by thunderblot but is often damaged by the stong induced electric field resulted from the stuck buildings (the lightning rod, tower, etc) around. In this circumstance, we should install the arrester in the cable. Normally the arrester will be installed near the equipment. To make sure that the arrester can be well earthed, the arrester should be installed between the feeder and the equipment. Then lead the grounding wire from the arrester and connect it to the earth. The earth resistance should be under 4 ohm and must be firmly connected to ensure the reliable discharge by lightning.

Sometimes the antenna can be installed outside the window, but the building must be located in the open fields with no corner. In this way, it can receive at least half of the satellite signal. But as a long-term using equipment , it is recommended that the antenna is installed in high places, while the outside installation can be only adopted as a temporary test.

The high-power microwave transmitting of the same band can not be around where the GPS antenna is installed. In addition, we should try to avoid the GPS antenna from the direct irradiation of high-power electromagnetic radiation.

If the length of the feeder is less than 100 meters, the antenna and equipment can be directly connected; between 100 meters to 200 meters, one more line amplifier is needed; ranging from 200 meters to 300 meters, two more amplifiers are needed. If you need longer feeder links, please contact us, GlobalTime Electronic Co., Ltd. We will provide the special program to you. The feeder usually adopt 1 / 2 inch RF cable whose loss is 12.8dB/100m from the United States Andrew's.

The primary considerations when setting up the feeder:

1. Do not bend too much, because it will result in a broken feeder conductor.
2. When we connect the feeder into the interior, it should be bent into U-shape to prevent In the feeder should be bent into the interior U-, to prevent water from flowing backward.

You can use GPS signal transponder to lead the signal to the interior. Generally speaking, GPS signals can be well received within 5 m of the transponder antenna. Because of the way of forwarding, it is much effective for the prevention of lightning and the protection of the host. Problems caused by the lightning is the transponder damaged. Due to a certain transmitting power, it is suitable for some occasions.

Table 2-1 Antenna Specifications

Frequency range	1575±5MHz;	RF connector	N-type connectors
Polarization	Right-hand circular polarization	Installation	Thread (M24 × 1.5) connection
Antenna gain	≥3.5dB；	Volume	φ96×126mm；
Amplifier gain	≥37dB；	Operating temperature	-45℃～85℃；
Noise coefficient	≤1.5dB；	Storage temperature	-50℃～90℃；
Interference suppression	25dB(f0±100MHz)；	Humidity	0～100%
Power consumption	3V×20mA；		

2.3 Indoor installation

After connecting 220V AC to the master device, the indicator light "Power" on the front panel should be lit and indicate that the running of power supply is normal. Then the status light starts to be yellow (red and green) and estinguishes in 1 minute. If GPS receiver is in good running, it will turn green about 15 minutes later and the system starts to work normally. To measure the BNC antenna socket with a mutimeter, the feed voltage should be up to 5V. Then connect the antenna cable with the antenna socket. Next, use a computer to pass through the IP address and network settings of the serial port configuration time server, save and exit, then restart GTT - 030 Network time server to make the network settings take effect. After reboot, input the IP address of the PING server in another computer to check the network settings correct or not. Then log on the network time server from SSH client to observe the satellite receiving state, the information on time tracking state of the server and so on. When the server locks the satellite time (The indicator light on the panel turns green), GTT - 030 starts to provide time information to other clients within the network. The specific process of software configuration can refer to the following chapter.

Chapter 3 Equipment Maintenance

3.1 Indicator state

Table 3-2 Indicator Status

Indicator	Status	Description
Power supply	on	The power supply is normal
	off	The power supply is abnormal
State	off	The server is unlock
	orange	The server is in the maintaining state and can not track the satellite, but the output time of the server is still available
	green	The server is in the normal tracking state

3.2 Server configuration debugging

GTT-030 network time server can conduct maintenance and management through the local serial cable connection or the remote telnet connection. The local connection needs to use a cross serial cable with connectors on both sides (that is, 2,3 feet of the two sides are cross connected). The management is carried out on the super terminal. The serial port configuration parameters of the super terminal are as shown in Figure 3-1. Under the remote telnet connection, you only need to enter: telnet <IP address of the server> under the command-line. The following example describes the maintenance methods with local connection, so does remote maintenance.

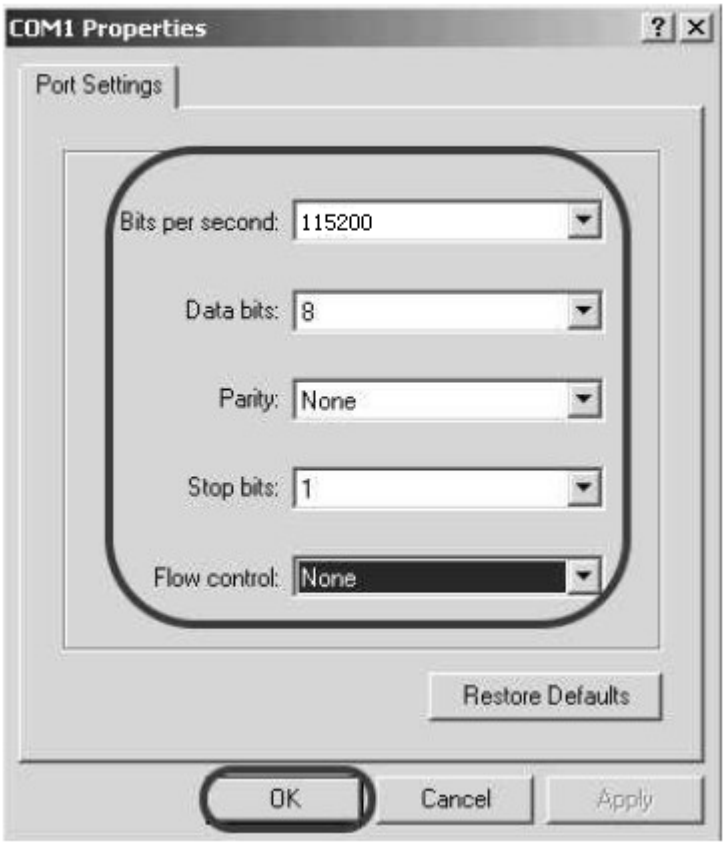


Figure 3-1 Terminal serial port Debugging settings

3.2.1 User Login

After connecting the hyper terminal, press ENTER and you will see the login screen just like 0. Then enter the user name " ntpuser " and the password "Users.".

Note: Pay attention to the last ".". When you have login in, you can set your own password.

```
Welcome to Globaltime NTP server!

GlobalTime.NTPSever login:
```

Login window

After logging in, there will be a interface, such as 0 configuration interface. There are totally 5 choices: view the network status, change network setting, display the status, change the password and exit. The detailed description of each function is introduced as follow.

```
1: Network status
2: Change network setting
3: Display the status
4: Change the password
5: Exit
Choice:
```

the main configuration window

3.2.2 View the network status

```
The network config of NetCard 1 :
IP address : 192.168.2.8
Netmask    : 255.255.255.0
Gateway    : 192.168.2.1
input y for continue , n for try again [y/n]
```

network configuration window

Press "2 ENTER" and the present network setting will be displayed, including IP address, subnet mask and gateway. If you enter "y", it will return to the previous menu.

3.2.3 Change network setting

When you press "2 ENTER" in the main configuration interface, initially it will ask whether to use DHCP protocol to assign IP address. If you would like to use DHCP protocol to assign IP address, then select "Y". Otherwise, select "N". GTT-030 support getting IP address through DHCP, but it always need a static IP address because the server needs to supply the network timing service to other devices. As a result, in DHCP network system, the recommended configuration is to assign a static IP address from the IP Pool of DHCP server to GTT-030. Other devices can use the static IP to access GTT-030.

When it asks whether to use DHCP, If you select "N", it will prompt to enter the server IP address, subnet mask and gateway IP address. Finally it will prompt whether to modify the network configuration in accordance with settings entered, then select "Y" and it will change the equipment configuration. This configuration can not take effect until rebooting the server. So we need to restart the server. We can modify the network configuration for many times before restarting the equipment, but only the last one can take effect. The configuration interface is shown in Figure 4.

```
Using DHCP?[y/n]n

IP address:192.168.2.60
Network Mask:255.255.255.0
IP of gateway(ENTER for no needed):192.168.2.254
Do you want to change the network setting like above?y
Please restart the machine to make the change active._
```

Figure 3-2 The network parameters configuration interface

Note: When it displays " Please restart the machine to make the change active." , press " ENTER" to return to the previous interface. Then select "4 Exit", the setting can take effect. If directly turn off the computer, it will result in the configuration failed.

3.2.4 Display the status

By entering "3" in the main configuration interface, you will enter the "check the work status" interface shown in Figure 3-3. The figure shows that the current time of the time server is of level 1. The time root deviation is 19.487 ms and the current UTC time is 1:38:40. There are 10 satellites which can be tracked in the sky. Note: the time shown is UTC time, which differs by 8 hours from China Standard Time (China time zone is +8). Entering "Q" will return to the main configuration screen while entering other keys will continue to the next step. When GTT-030 network time server work properly, the time level is 1, or else it is 16.

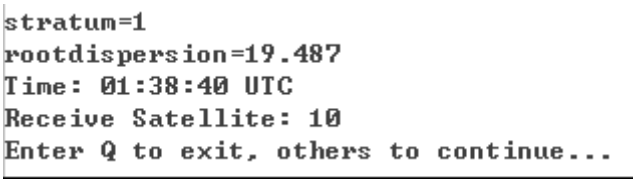


Figure 3-3 Check the work status

3.2.5 Chage the password

If type "4" in the main configuration interface, it will enter into the "change password" screen, shown as 0. At first, you need to type the original password. If correct, it will prompt to type a new password. The user password contains 5-8 characters. Note: the password can not be too simple. If take some meaningful words as the password, it will probably be refused by the system. So the password with combinations of upper- and lower- case strings is appropriate.

```
Changing the password of user ntpuser
Changing password for ntpuser
Old password:
Enter the new password (minimum of 5, maximum of 8 characters)
Please use a combination of upper and lower case letters and numbers.
Enter new password:
Re-enter new password:
Password changed.
Press any key to continue...
```

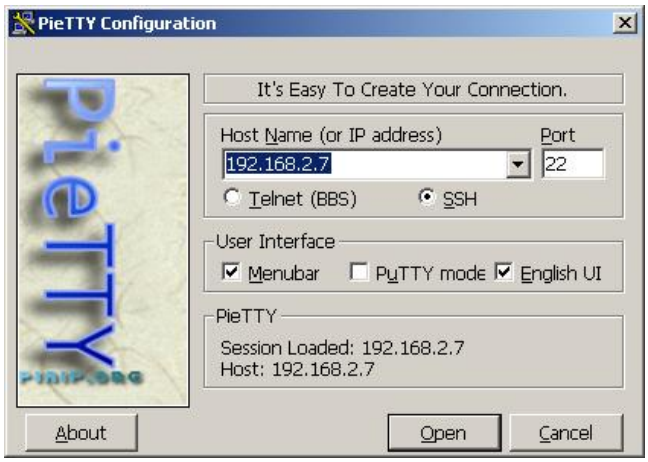
Change the password

3.2.6 Exit

If type "5" in the main configuration interface, it will return to the user-login screen.

3.2.7 Time server logon through the network

For the sake of the system security, the time server supports login by SSH. The CD-ROM is accompanied by a SSH terminal software: pietty.exe, which can be directly copied to the computer and work properly. The login configuration is as the following interface. The interface after connecting is the same as the HyperTerminal login.



SSH login configuration interface

3.3 Remote dial-up maintenance

We can use the MODEM to achieve remote dial-up maintenance with the serial monitoring port of GTT-030 network time server. In order to make it, please follow these steps:

- Initially, set the MODEM to auto answer mode and connect the MODEM and a computer serial port with a serial cable. The configuration is shown in Figure 3-1. Type the following three commands in the HyperTerminal:

  atS0=1

  at&W0

  at&Y0

Note: The commands are case sensitive.

- Connect the MODEM and GTT-030 network time server monitoring port with a serial cable. Then plug the telephone line. Finally, dial this number through the Hyper Terminal of another computer with MODEM and it can be connected with the server. The configuration is as introduced in section 3.2.

3.4 Client configuration

Regarding WinXP/2003 system, it includes NTP services and can be directly set. The specific setting methods are as follows:

Firstly, double click the time mark on the right side of the windows task bar and it will pop up an interface with date and time properties. Then select the Internet time screen, which is shown as the picture in the next page.

Secondly, modify the windows default time server, such as modifying to 192.168.2.8.

Thirdly, click "Apply", and then "Update Now". After a successful synchronization, it will show successful ****** synchronization time in **year, **hour, **minute. The next synchronization: **year, **mounth **Date, **hour, **minute. Windows default is to synchronize once a week. If the screen displays RPC not available, you should open the Control Panel, select Administrative Tools / Services, search windows Time from the services list, choose to automatically open the service and restart it.

Fourthly, if you consider the synchronization cycle is too long, you can modify the registry to shorten the synchronization cycle. The specific registry key is in:

\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders\NtpClient\SpecialPollInterval

The default is 604800 = 60 × 60 × 24 × 7, namely, a week.

synchronization once a day: The default is 86400

synchronization once an hour: The default is 3600

synchronization once ten minutes: The default is 600

Fifthly, after modifying the registry, you should stop windows time service and restart it. Then the time interval can be updated.

If it has been installed with other time synchronization software, you need to uninstall the software and restart the computer. The windows time service can work normally.

For Win2000/98 operating system, the time synchronization software provided by our firm or provided by the third-party are both available. The specific configuration can be referred to the respective user manual.

For UNIX systems, in general, there is ntpd daemon or xntpd daemon. Create the ntp.conf configuration file under the / ETC directory and type "server ******" (time server IP) in it. Then starting the daemon will do.

Regarding the details, please refer to the user manual or consult us directly .

3.5 Troubleshooting

3.5.1 All indicator lights are off when power is on

Check whether the power outlet is with electricity. There is a fuse socket in the device. You need to unplug it and check whether the fuse is intact.

3.5.2 Receiving no satellite signals for a long time

Emphasis should be placed on verifying whether the feeder system is normal.

Firstly, unplug the feeder on the side at the device. Then measure the BNC socket with a multimeter. Normally there is 5V antenna supply voltage. Otherwise, it shows that the equipment has been damaged.

Then, verify the outdoor antenna is well connected, such as verifying the outdoor joints are tight, the connectors are waterproof, the antenna is aleak and so on. You should troubleshoot the obvious problems one by one.

Last, disconnect the antenna connector and measure the resistance of the feeder. When the remote end is open, the near-end resistance should be infinite. Besides, when the remote end is shorted, the near-end resistance will be only a few ohms. If it is shown abnormal, verify the feeder and the connctor is intact. The normal faults: the quality of the line is not good; the connectors are not done well; lines are scratched or bitten by small animals, etc. If the feeder is added a lightning arrester or an antenna amplifier in the middle, you still need to verify the two components is intact.

After eliminating the above breakdown, if it still can not receive the satellite signal, please contact the service hot line of Shanghai GlobalTime Electronic Co., Ltd. Our engineers will help you with the further processing.

3.5.3 Can not ping the time server after configuration

First, verify the physical network connection. You can see if the corresponding connection-status light is normal by observing HUB or switch connected with the time server.

And then check if there is something wrong with the network settings. You can use a crossing cable to connect the server to the computer directly to see if ping is ok.

Then use HUB to test in the same network segment. Finally test the different segments. Following these steps, it is easy to troubleshoot. Some firewall software on your computer will provide a protective screen from ping operation. So it’s better to check the network after turning off the firewall.

You may also verify the IP address without devices and the IP reply set by the time server.

3.5.4 Instable state of receiving satellite signal/equipment is in hold mode

In general, it is caused by the improper site selection of the satellite receiver antenna. If this state shows often, you should consider to select another site to install the antenna, that is, a place free of anything overshadowed and the surrounding microwave interference.

3.5.5 The client can not receive timing service

NTP protocol usually proceeds timing service through port 23 with UDP protocol and sometimes with TCP protocol. So port 23 service should be allowed to go through the intranets gateway and the firewall. Please check the gateway and the firewall configuration.

3.5.6 How to configure the network equipment to receive time service

NTP protocol is an international standard protocol. The network equipment of many manufacturers can receive NTP protocol to adjust their own time. For example, the routers of Cisco, Avaya, Ascend and Huawei can all receive NTP services. Some series switches also support the NTP protocol. For instance, the configuration command of Cisco router is:

ntp server <IP address>

Regarding the specific configuration, please refer to the manual provided by the manufacturers. To unify the network time by NTP protocol can effectively improve the quality of network service. It can also judge the cause of the malfunction by checking the unified time Log files when the network goes wrong.

Chapter 4 Detailed performance index of the equipment

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GPS receiver

- 12 channel GPS receiver
- L1-Band, C/A Code
- position hold-type
- Cold-start time: 200 seconds
- Warm-start time: 50 seconds
- Hot-start time: 25 seconds
- Positional Accuracy: 100 meters

Timing performance

- Server Time Level: Stratum 1
- Server time precision: 1ms
- Precision of client time: 10ms
- Timing capacity: >100 times per second

Network protocol support

- RFC 1119/1305 NTP v2/v3/v4
- RFC 1769/2030 SNTP v2/v3/v4
- 10/100M Base-T adaptive Ethernet
- SSH
- FTP
- DHCP

Power supply and the environment:

- Power supply: 15W, 220 ~ 240V AC(or -48VDC)
- Environment:
- Temperature: 0 ~ 50 ℃
- Relative humidity: 0～90%

Chapter 5 Appendix

Shanghai GlobalTime Electronic Co., Ltd is a leading company that focuses on professional time synchronization products and services. We provides 7x24-hour hot line for technical support. If you have any questions about our products or the solutions, please not hesitate to contact us according to the following address:

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